

the ground surface at least once within the past 35,000 years or recurrent movement within the past 50,000 years (10 CFR 100, Appendix A).

KAFB and SNL/NM are located in a region with relatively moderate to high seismicity. Modified Mercalli Intensities of up to VII have been reported (DOE 1996f). Over the last 100 years, only three earthquakes have reportedly caused damage in Albuquerque (DOE 1996f). Since 1966, New Mexico has experienced four moderate earthquakes, all approximately magnitude 5 on the Richter scale. Two of these were in Dulce (near the Colorado border in north-central New Mexico), one was in Gallup (near the Arizona border in west-central New Mexico), and one was in Eunice (extreme southeast corner of New Mexico, near the Texas border). The closest of these (Dulce and Gallup earthquakes) were epicentered about 200 kilometers (125 miles) from the site. The largest earthquake experienced in the Albuquerque area occurred on January 4, 1971, and measured magnitude 4.7. There was no appreciable damage to SNL/NM buildings, although some cracks were noted that could have predated the earthquake. This event had a reported Modified Mercalli Intensity of VI at its epicenter, which was located some 12 kilometers (7.4 miles) north-northwest of SNL/NM, as measured from TA-V. Within a radius of 100 kilometers (62 miles) of SNL/NM, a total of 14 significant earthquakes (i.e., having a magnitude of at least 4.5 or a Modified Mercalli Intensity of VI or larger) have been documented, with none centered closer than the January 1971 event (USGS 2001c). Since 1973, 37 earthquakes have been recorded within 100 kilometers (62 miles) of SNL/NM ranging in magnitude from 1.6 to a magnitude 4.8 event in January 1990. The closest of these minor-to-light earthquakes was a July 1985 1.6-magnitude event that was reportedly felt and centered about 6 kilometers (3.7 miles) north of TA-V within KAFB boundaries. All but a few of the remaining 37 earthquakes had epicenters greater than 60 kilometers (37 miles) away. The most recent was a Richter magnitude 4 earthquake that occurred in January 1998 at a distance of 58 kilometers (36 miles) from the site (USGS 2001d).

A nondamaging earthquake producing a Modified Mercalli Intensity of less than III is predicted to have an annual probability of occurrence of 1 in 2 (i.e., once every 2 years) and a damaging event has a probability of 1 in 100 (i.e., once every 100 years) (DOE 1996f). For reference, a comparison of Modified Mercalli Intensity (the observed effects of earthquakes) with measures of earthquake magnitude and ground acceleration is provided in Section F.5.2 (see Appendix F).

As discussed in more detail in Section 4.2.5, the U.S. Geological Survey has developed new earthquake hazard maps that are based on spectral response acceleration. These maps have been adapted for use in the new International Building Code (ICC 2000) and depict maximum considered earthquake ground motion of 0.2- and 1-second spectral response acceleration, respectively, based on a 2 percent probability of exceedance in 50 years (i.e., 1 in 2,500). SNL/NM is calculated to lie within the 0.61g to 0.62g mapping contours for a 0.2-second spectral response acceleration and the 0.17g to 0.18g contours for a 1-second spectral response acceleration. For comparison, the calculated peak ground acceleration for the given probability of exceedance is approximately 0.27g (USGS 2001e).

The potential for future damaging volcanic activity at SNL/NM and the vicinity is considered to be low (DOE 1996f). As for other geologic hazards, slope instability is a concern on steeper slopes such as along water-cut drainages and on mountain slopes to the east of the SNL/NM TAs in the Manzanita Mountains. However, most SNL/NM facilities are constructed on level ground or on the gentle slopes of alluvial fan sediments.

Several soil associations occur across KAFB and are derived primarily from materials eroded from the nearby mountains and deposited as alluvial fans. These include the Bluepoint-Kokan, Madurez-Wink, Tijeras-Embudo, Kolob-Rock outcrop, and Seis-Orthids associations, with the Kolob-Rock outcrop confined to the eastern portion of the site. These soils are moderately to very steep, well-drained, loamy, and stony soils and include basalt, sandstone, and limestone outcrops. The remainder of the soils are generally well

drained to excessively drained and loamy, cobbly, or stony. Wind erosion hazard is severe on terraces and on mountain and hill slopes, and the hazard for water erosion is generally moderate on alluvial fans, foothills, and highlands. The soils are suitable for standard construction techniques. No soils are classified as prime farmland (DOE 1996f).

There are no known capable faults on KAFB. The closest mapped fault to TA-V is the West Sandia Fault, which is located about 1 kilometer (1.6 miles) to the east of the area. Surficial stratigraphy in the southern portion of SNL/NM is dominated primarily by unconsolidated sediments of the Santa Fe Group deposited by the Tijeras Arroyo that attain a thickness of up to 90 meters (300 feet). Soils encompassing TA-V are mapped as Tijeras gravelly fine sandy loam. This unit has a moderate water erosion hazard, but is otherwise suitable for development (SNL/NM 1993).

4.3.6 Water Resources

4.3.6.1 Surface Water

KAFB and SNL/NM are located on the East Albuquerque Mesa, which slopes southwest toward the Rio Grande, the major water drainage in the area. This river flows north to south in the vicinity of KAFB and is located approximately 10 kilometers (6 miles) to the west of the KAFB boundary and SNL/NM facilities (DOE 1996f). Surface water features are depicted in **Figure 4-15**. Surface water from KAFB and SNL/NM, primarily runoff, flows through several major and many small, unnamed arroyos. These rather steep-walled, intermittent stream channels flow primarily only in response to runoff from summer thunderstorms, as runoff from snowmelt in the Manzanita Mountains to the east rarely reaches the lower portions of the arroyos or the Rio Grande. Tijeras Arroyo is the primary drainage feature on KAFB. Tijeras Arroyo enters KAFB just northeast of TAs II and IV and runs southwest before being joined by Arroyo del Coyote at a point about 3.2 kilometers (2 miles) upstream of where Tijeras Arroyo leaves KAFB, and south of TA-IV. Tijeras Arroyo then joins with the Rio Grande at a point approximately 8 kilometers (5 miles) west of the KAFB boundary (DOE 1996f). With the exception of flow from two springs (Coyote Springs and Sol Se Mete), there are no perennial streams or other natural surface water bodies at KAFB. Most runoff and spring seepage infiltrates into the ground and either does not reach a drainage or travels only a relatively short distance down the arroyos and is therefore not conveyed off site.

Onsite arroyos at KAFB and SNL/NM are not classified and, therefore, are protected by default under State of New Mexico surface water quality standards for the uses of livestock watering and wildlife habitat (New Mexico Administrative Code 20.6.4.10). New Mexico standards also apply to the Rio Grande with designated uses for irrigation, limited warm water fishery, livestock watering, wildlife habitat, and secondary contact. Additionally, a stretch of the Rio Grande through Pueblo of Isleta beginning approximately 10 kilometers (6 miles) downstream of the Tijeras Arroyo has additional water quality standards associated with the added designated protected uses for primary contact and primary contact-ceremonial. Due to the ephemeral nature of surface water on KAFB and SNL/NM, it is not a source of municipal, industrial, or irrigation water.

SNL/NM wastewater discharge to arroyos is limited to stormwater runoff. Runoff from TAs-I, -II, and -IV is collected in storm sewer systems that discharge to Tijeras Arroyo. There is no discharge from TAs-III and -V. Storm-water runoff from TAs-I, -II, and -IV is monitored for NPDES permit compliance under the EPA's NPDES Stormwater Multi-Sector General Permit (Permit Number NMR05A181). Monitoring results are reported in the annual site environmental report (SNL/NM 2001b). Industrial and sanitary effluent is collected and discharged to the city of Albuquerque sanitary sewer system in accordance with city permit requirements. As several research reactors in TA-V have the potential to produce radiologically contaminated wastewater, reactor process wastewater from responsible facilities is sent to the Liquid Effluent

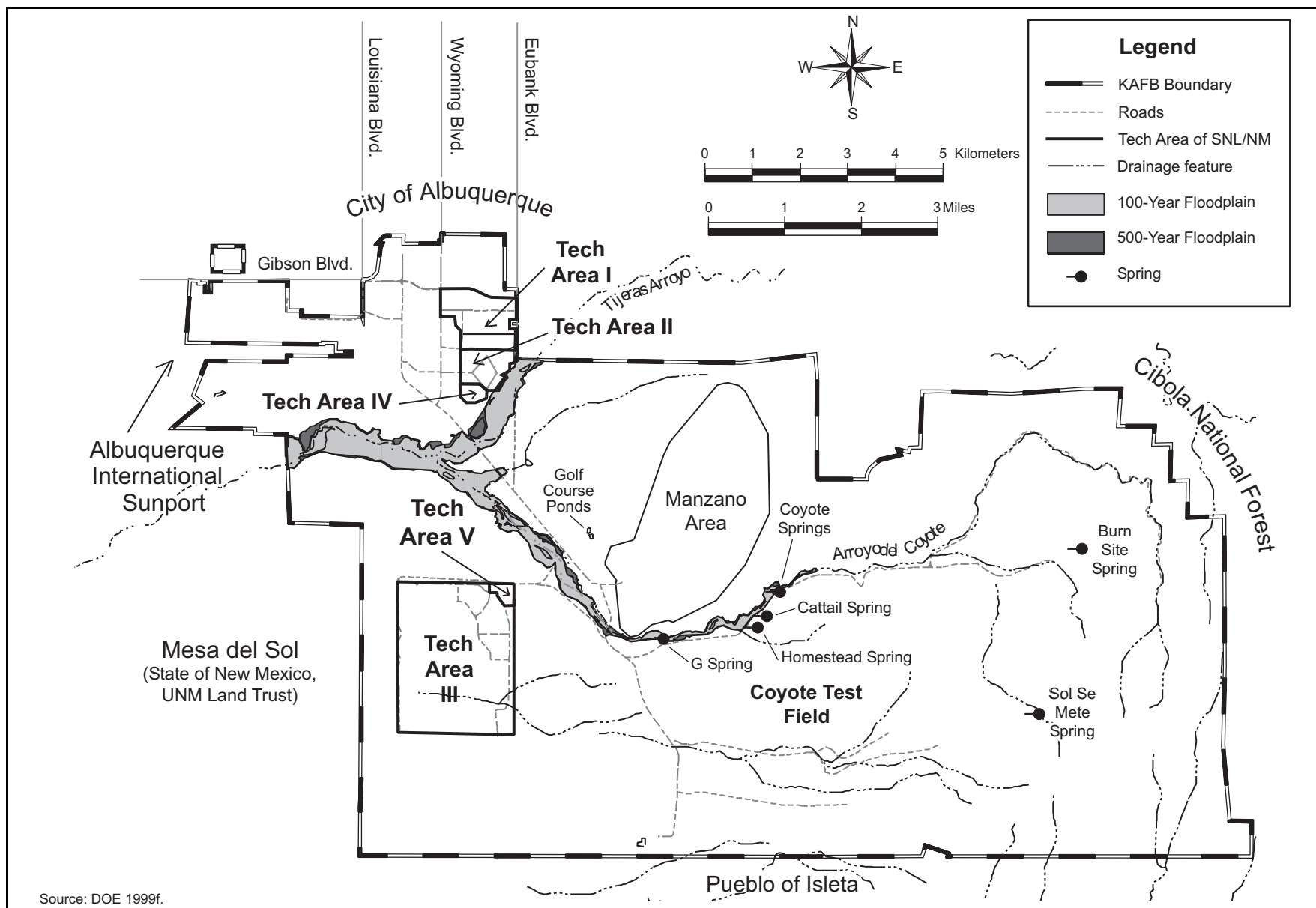


Figure 4-15 Surface Water Features at KAFB

Control System for screening. This system consists of three 18,900-liter (5,000-gallon) holding tanks, an ion-exchange and filter system, and an automatic alarm to alert personnel to the presence of radionuclides. The collected effluent is sampled and analyzed for tritium, gross alpha, gross beta, and gamma activity to ensure that it meets permit limits before being discharged to the sanitary sewer system. SNL/NM discharges about 3 million liters (800,000 gallons) per day of wastewater to the sewer system (SNL/NM 2001b). This wastewater is treated at the Albuquerque sewage treatment plant and ultimately discharged to the Rio Grande at a point about 1.1 kilometers (0.7 miles) north of Tijeras Arroyo. SNL/NM also has three septic systems that service remote locations and are periodically serviced by a licensed contractor (SNL/NM 2001b). Industrial and sanitary effluent management is further discussed in Section 4.3.12.

Floodplains on KAFB are generally confined to the major arroyos as shown in Figure 4–15. Although not shown in Figure 4–15, there are narrow 100-year floodplains that are confined to existing drainage channels and low-lying streets and vacant areas in TA-I. Otherwise, no SNL/NM facilities are built in a 100- or 500-year floodplain.

TA-V contains no permanent, natural surface water bodies and is not located within a delineated floodplain. A drainage ditch located on the northern border of the area conveys stormwater runoff to Arroyo del Coyote to the east.

4.3.6.2 Groundwater

Groundwater beneath the western portion of KAFB encompassing SNL/NM exists within an interconnected series of water-bearing geologic units, principally the Sante Fe Group, which comprise the Albuquerque-Belen Basin aquifer (**Figure 4–16**). This is the major source of groundwater within the Albuquerque Basin. Thus, the Albuquerque-Belen Basin aquifer (i.e., a valley-fill aquifer) is considered a Class II aquifer (i.e., currently used or potentially available for drinking water or other beneficial use) (DOE 1996f). The local hydrostratigraphy and associated water table elevations within the Albuquerque-Belen Basin aquifer beneath the western and central portions of KAFB are influenced by the Sandia/Tijeras/Hubbell Springs Fault system which transects KAFB, creating distinct hydrogeologic regions. As result, depth to the regional water table decreases appreciably to the east within blocks of downfaulted strata and ranges from approximately 150 meters (500 feet) near the western boundary of KAFB to about 45 meters (150 feet) near the Hubbell Springs Fault just southeast of TA-III. Shallow groundwater may be found near the surface in shallow alluvium along portions of Arroyo del Coyote northeast of TA-III. In contrast, groundwater beneath the far eastern portion of KAFB primarily occurs in limited quantities in the fractured bedrock, with the depth to groundwater thought to exceed 45 meters (150 feet). Groundwater flow is generally north to northwest in the northwestern portion of KAFB where TAs-I, -II, and -IV are located and generally to the west in the eastern portion of KAFB and within the central, faulted hydrogeologic region of KAFB (DOE 1996f). Locally, the direction of groundwater flows is to the northeast in the northern corner of KAFB towards the cone of depression created by base and city wells (SNL/NM 2001b). Perched groundwater bodies have also been identified at a depth of some 90 meters (300 feet) beneath TAs-I, -II, and -IV.

Sources of recharge to the basin, and to the Albuquerque-Belen Basin aquifer in particular, include precipitation runoff and snowmelt along the basin margins, underflow from interconnections with aquifers in adjacent basins, and surface recharge from irrigation and other artificial sources (DOE 1996f). Locally, recharge is in the form of infiltration of runoff through arroyos. However, the rate of groundwater withdrawal in the region, particularly by city of Albuquerque and KAFB supply wells, exceeds the relatively low recharge rate of 0.01 to 0.25 centimeters (0.004 to 0.1 inches) per year, a condition called overdraft. As a result, the regional water table just beneath the western portion of KAFB has been declining at a rate of 0.06 to 0.9 meters (0.2 to 3 feet) per year, while water levels farther to the east of the Sandia/Tijeras/Hubbell

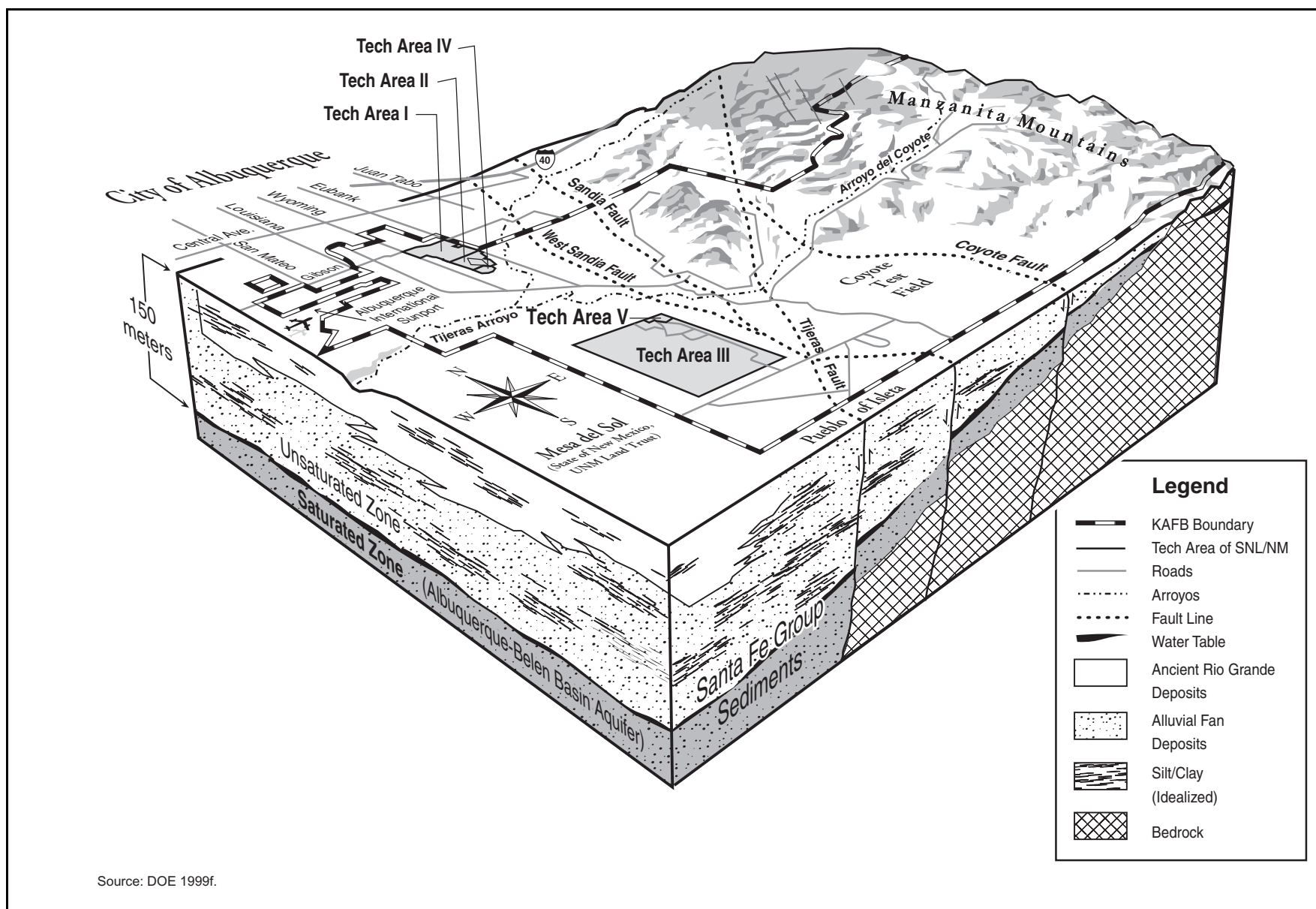


Figure 4-16 Conceptual Diagram of Groundwater System Underlying KAFB

Springs Fault system have been much less affected. During the 12-year period from 1985 through 1996, water levels declined by more than 11 meters (35 feet) in the extreme northwestern portion of KAFB.

A network of monitoring wells is used to collect samples for characterizing baseline water chemistry and groundwater contamination, which is part of the site's environmental monitoring program. Groundwater quality at SNL/NM has been impacted by past activities at SNL/NM sites, with the sources of contamination under investigation. Sites with potential or known groundwater contamination at SNL/NM are Sandia North, which includes TA-I and TA-II; the Mixed Waste Landfill within the TA-III complex; locations in TA-V; the Lurance Canyon Burn Site, located in the eastern portion of KAFB; and the Chemical Waste Landfill, also within TA-III. The primary contamination at TA-V is trichloroethene which has been detected at levels of about three to four times the maximum contaminant level and attributed to the disposal of wastewater released to the Liquid Waste Disposal System site from 1963 to 1967. Sources of previously high levels of nitrate, including septic tanks and leachfields, have since been closed. Nitrate levels exceeding the maximum contaminant level have also been detected in groundwater at the Lurance Canyon Burn Site. Detailed information on groundwater monitoring including analytical results is presented in the annual site environmental report (SNL/NM 2001b).

The groundwater beneath SNL/NM and adjacent areas is the source of drinking water for SNL/NM, KAFB, and adjacent portions of the city of Albuquerque and the Pueblo of Isleta. The local groundwater is also used for irrigation and industry. Water use is detailed in Section 4.3.2.4.

Groundwater beneath TA-V occurs within the Albuquerque-Belen Basin aquifer. The depth to groundwater is inferred as approximately 100 meters (330 feet) and the direction of flow is generally to the northwest. As previously discussed, trichloroethene and nitrate are contaminants present in the groundwater beneath TA-V. In FY99, trichloroethene was again detected in one monitoring well in excess of the EPA Maximum Contaminant Level of 10 micrograms per liter at a maximum concentration of 23 micrograms per liter. The only inorganic chemical detected in excess of applicable regulatory criteria was nitrate (Maximum Contaminant Level of 10 milligrams per liter) at a maximum concentration of 16.3 milligrams per liter (SNL/NM 2001b).

4.3.7 Ecological Resources

4.3.7.1 Terrestrial Resources

KAFB is located at the juncture of four major North American biological provinces: Great Basin, Rocky Mountains, Great Plains, and Chihuahuan Desert. Each province influences the existing biological communities. KAFB contains a diversity of biological resources due, in part, to these influences and an elevation change from a low point of approximately 1,585 meters (5,200 feet) in Tijeras Arroyo to a high point of 2,352 meters (7,715 feet) at Mount Washington in the Manzanita Mountains.

The four major vegetation associations at KAFB, grassland, woodland, riparian, and altered, are distinct in the form and composition of their vegetation (see **Figure 4-17**). The grassland association occupies the lower alluvial slopes and terrace surfaces of the Rio Grande valley near the city of Albuquerque. It is the dominant vegetation association on KAFB, west of the Withdrawn Area. Important species of this association include galleta, sand dropseed, ring muhly, black grama, and little bluestem (SNL/NM 1993). Woodland vegetation occurs primarily on the upper alluvial slopes and mountainous areas of the Withdrawn Area. Species present within woodland areas change with altitude. For example, one-seed juniper is present between 1,829 to 1,890 meters (6,000 to 6,200 feet), while an even mix of pinyon pine and one-seed juniper are found between 1,890 to 1,981 meters (6,200 to 6,500 feet). Many areas of the woodlands are becoming progressively choked with deadwood and dense thickets of young trees. Isolated, narrow bands of riparian

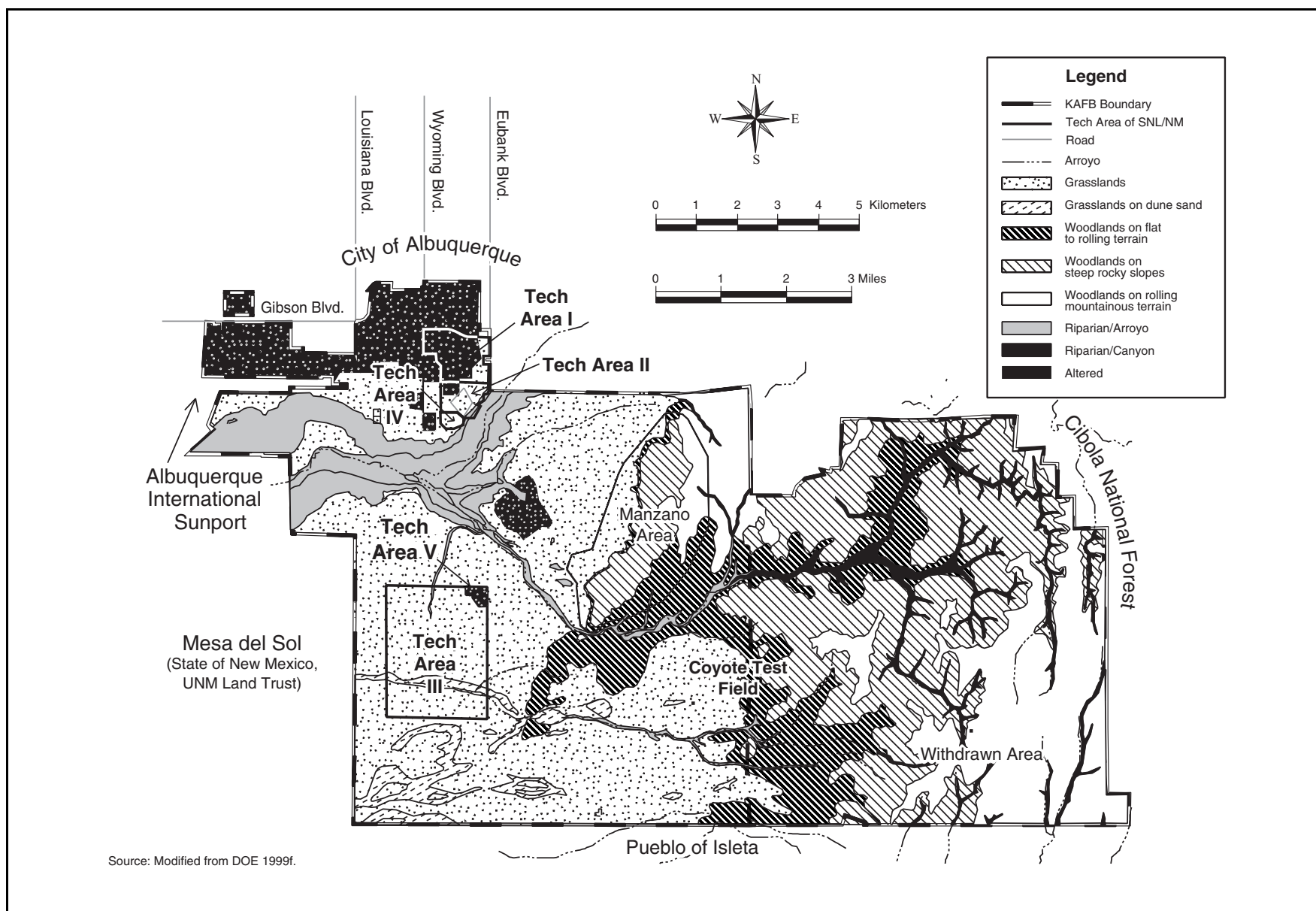


Figure 4-17 Vegetation Associations at KAFB

vegetation occur along the surface drainages of KAFB. These drainages are predominantly ephemeral and contain flow only after large rainfall events. Riparian vegetation constitutes less than 5 percent of the area of KAFB and is limited primarily to the upper reaches of Arroyo del Coyote and associated drainages. The riparian woodland vegetation is dominated by exotic species, principally salt-cedar, which is widespread in the arroyos on KAFB. Human development and activities have created altered vegetation associations at KAFB. This vegetation ranges from no vegetative cover to manicured landscapes, such as the golf course. Most of this vegetation consists of nonnative species. At least 267 plant species occur on KAFB.

At least 195 species of amphibians, reptiles, birds, and mammals occur on KAFB. This diversity is due, in part, to the variety of habitats, which include cliff faces, caves, abandoned mines, and drainages, in addition to the four major vegetation associations. Although an altered habitat, the grass, ponds, and variety of trees at the KAFB golf course provide a particularly rich haven for animals, including waterfowl and shorebirds. The most important ecological factor that controls wildlife communities on KAFB is the limited availability of surface water. Common animals on KAFB include the whiptail lizard, red-spotted toad, American kestrel, ash-throated flycatcher, coyote, and deer mouse. Game animals which occur on the site, primarily within woodland and canyon habitats, include the mountain lion, black bear, and mule deer; however, hunting is not permitted on site. Raptors, such as the American kestrel and Cooper's hawk, and carnivores, such as the coyote and mountain lion, are two ecologically important groups on the KAFB. A variety of migrating birds have been recorded at the site. Migratory birds are protected under the Migratory Bird Treaty Act.

TA-V is located within the grassland vegetative association; however, the site has been altered by development and little natural habitat is present. Grasses present within undeveloped portions of the area would include those typical of the grassland association on the site as a whole. Animal species common to the grassland vegetative association, such as the coyote and red-tailed hawk, would be expected to be found in the general vicinity of TA-V.

4.3.7.2 Wetlands

Natural spring-fed wetlands form a minor component of the riparian habitat on KAFB and are cumulatively less than 0.4 hectares (1 acre) in size. KAFB has six wetlands, all associated with springs (see Figure 4-15). These wetlands are designated as jurisdictional wetlands under Section 4.04 of the Clean Water Act, because they have the soils, hydrology, and vegetation that meet standard criteria. The largest wetland is Coyote Springs in Arroyo del Coyote. Two of the wetlands, Sol se Mete and Burn Site Springs, are in the canyons of the Withdrawn Area. Species characteristic of these wetlands include wire rush, three-square, Torrey rush, and cattail. Only the Burn Site Spring is on land used by SNL/NM. The U.S. Forest Service manages a tank that collects water for wildlife at this spring and the Sol se Mete Spring. There are no wetlands located within TA-V.

4.3.7.3 Aquatic Resources

There is no permanent natural aquatic habitat on KAFB. Drainages found on the site are predominantly ephemeral and contain flow only after large rainfall events. The U.S. Air Force administers constructed ponds on the KAFB golf course and a constructed lake, Christian Lake, in the southern part of KAFB. There are no aquatic resources located within TA-V.

4.3.7.4 Threatened and Endangered Species

There are four agencies that have authority to designate threatened, endangered, and sensitive species in New Mexico. The agencies are the USFWS, the New Mexico Game and Fish Department, the New Mexico Forestry and Resource Conservation Division, and the U.S. Forest Service. The State of New Mexico

separates the regulatory authority for plants and animals between the Forestry and Resource Conservation Division and the Game and Fish Department, respectively. The U.S. Forest Service lists species for special management consideration on lands under their jurisdiction and protects these species under the authority of the Endangered Species Act of 1973.

Table 4–24 lists the threatened, endangered, and sensitive plant species on KAFB. One state-listed sensitive plant species, the Santa Fe milkvetch, occurs on the low hills in the southwestern part of KAFB. The Strong prickly pear, found near the northern boundary of KAFB, is on the State of New Mexico Rare Plant Review List.

Table 4–24 Listed Threatened and Endangered Species, Species of Concern, and Other Unique Species that Occur or May Occur at SNL/NM

<i>Species</i>	<i>Federal Classification</i>	<i>State Classification</i>	<i>Occurrence on Sandia</i>
Mammals			
Gunnison's prairie dog	Unlisted	Special Concern	Resident
Pale Townsend's big-eared bat	Special Concern	Special Concern	Occasional
Small-footed myotis	Special Concern	Special Concern	Occasional
Western spotted skunk	Unlisted	Special Concern	Low probability of occurrence
Birds			
American peregrine falcon	Special Concern	Threatened	Not documented
Baird's sparrow	Special Concern	Threatened	Winter visitor
Bell's vireo	Special Concern	Threatened	Winter visitor
Black swift	Unlisted	Special Concern	Occasional in summer and as a migrant
Ferruginous hawk	Special Concern	Special Concern	Transient
Gray vireo	Special Concern	Threatened	Occasional
Loggerhead strike	Special Concern	Special Concern	Resident
Mountain plover	Endangered	Special Concern	Not documented
Swainson's hawk	Special Concern	Special Concern	Occasional
Western burrowing owl	Special Concern	Special Concern	Occasional
White-faced ibis	Special Concern	Special Concern	Casual
Reptiles			
Desert massasauga	Special Concern	Unlisted	Low probability of occurrence
Texas horned lizard	Special Concern	Special Concern	Resident
Texas longnose snake	Special Concern	Special Concern	Moderate probability of occurrence
Plants			
Grama grass cactus	Special Concern	Unlisted	Resident
Sante Fe milkvetch	Special Concern	NML2	Resident
Strong prickly pear	Unlisted	NML3	Not documented

NML2 = New Mexico List 2: Official listing of plant species that are vulnerable to extinction or extirpation within the state due to rarity or restricted distribution, but are not protected under the New Mexico Endangered Plant Species Act.

NML3 = New Mexico List 3: Official listing of plant species that are on the New Mexico Rare Plant Review List as species for which more information is needed, but are not protected under the New Mexico Endangered Plant Species Act.

Source: DOE 1999f.

The peregrine falcon was the only federally listed threatened or endangered animal species that may frequent KAFB. A probable sighting near Mount Washington was likely a migrant. No nesting activity of this species has been observed, and KAFB contains only marginal nesting habitat. In 1997, the U.S. Air Force conducted a raptor survey of KAFB and did not observe any listed raptor species. On August 25, 1999, the USFWS delisted the American peregrine falcon from the Federal list of endangered and threatened wildlife. The USFWS has determined that this species has recovered following restrictions on the use of organochlorine

pesticides (such as dichloro-diphenyl-trichloroethane) in the United States and Canada, following the implementation of successful management activities (64 FR 46541). On February 16, 1999, the USFWS designated the mountain plover as a proposed threatened species. Although KAFB could contain potential habitat for the mountain plover, numerous avian surveys of the Withdrawn Area and KAFB in general have not documented its presence. No federally proposed or candidate species occur on KAFB. In 1993, a colony of state-listed threatened gray vireos was discovered in the western foothills of the Withdrawn Area on land controlled by the U.S. Air Force. This is the largest known concentration of gray vireos in the State of New Mexico. Eight species of concern have been observed on KAFB, in addition to 13 migratory nongame birds of management concern for the USFWS Region 2. These species are protected under the Migratory Bird Treaty Act. Four state-listed threatened animal species occur on KAFB. One state-listed sensitive species, Pale Townsend's big-eared bat, has been observed hibernating in two caves. No critical habitat for threatened or endangered species has been identified on KAFB.

No federally listed threatened and endangered species utilize TA-V. However, since TA-V is located in the grassland plant association sensitive species could frequent the area. No designated critical habitat is present on TA-V.

4.3.8 Cultural and Paleontological Resources

Cultural resources are human imprints on the landscape and are defined and protected by a series of Federal laws, regulation, and guidelines. A draft *Cultural Resource Management Plan for Kirtland Air Force Base New Mexico* addressing resources across the entire base is summarized in the *SNL/NM SWEIS*. Due to the paucity of identified cultural resources under DOE jurisdiction, DOE has not prepared a cultural resource management plan. Since the first documented survey in 1936, both KAFB and the DOE buffer zones (land bordering the site to the southwest) have been the subject of cultural resource studies. Over 160 cultural resource investigations, reports, and studies have been conducted, most in the last 10 years. Approximately 75 percent of the area has been studied. Within the boundaries of KAFB and the DOE buffer zone, 284 prehistoric and historic archaeological sites have been recorded, of which 192 have been recommended as eligible or potentially eligible for the National Register of Historic Places.

Cultural sites are often occupied continuously or intermittently over substantial time spans. For this reason, a single location may contain evidence of use during both historic and prehistoric periods. In the discussions that follow, the numbers of prehistoric and historic resources are presented. However, the sum of these resources may be greater than the total number of sites reported due to this dual-use history at sites. Therefore, where the total number of sites reported is less than the sum of prehistoric and historic sites, certain locations were used during both periods.

4.3.8.1 Prehistoric Resources

Predominant among the prehistoric sites on KAFB are scatters of artifacts. Some artifact scatters consist of only stone debris from tool making and some tools themselves, while others have only ceramic shards or have both stone and ceramic artifacts. Some sites have just the artifact scatter, while others have features associated with the scatter. These features are often thermal features (such as hearths or ash pits) or structural features (such as remnants of walls or other forms of structures). A total of 181 sites have evidence of prehistoric use, of which 141 are eligible or potentially eligible for listing on the National Register of Historic Places. Because not all of the sites have been inventoried and buried sites would likely not have been identified during many past surveys, the potential for the presence of more sites is high. TA-V has been completely inventoried for prehistoric sites and no sites have been identified.

4.3.8.2 Historic Resources

As with prehistoric sites, historic sites on KAFB consist of artifact scatters, except that the artifacts present are things such as fragments of metal, pieces of ceramic or porcelain dishes, household items such as kitchen utensils, and other items one might find associated with a habitation. These scatters are often associated with features such as historic fences, roads, mining features (e.g., placer mining pits), or remnants of habitations. Of the historic sites, mining sites are the most common, followed by habitations, then sites related to agriculture and ranching, then small, isolated trash scatters. A total of 153 sites have evidence of historic use, of which 88 are eligible or potentially eligible for listing on the National Register of Historic Places.

Within KAFB, 579 architectural properties have been recorded and assessed for National Register of Historic Places eligibility, of which 9 individual properties have been recommended as eligible or potentially eligible for the National Register of Historic Places. Most sites were recorded by the 377th Air Base Wing of KAFB, under the auspices of the U.S. Department of Defense Legacy Program, and are on KAFB lands. Few of these properties predate World War II, and most were constructed during the 1940s and 1950s. Recent studies identified 21 buildings in TA-I that are of historic interest, and further study by DOE, in consultation with the New Mexico State Historic Preservation Office, will determine if these buildings are eligible for the National Register (SNL/NM 2001b). The architectural properties in TA-II, as a group, are eligible for National Register of Historic Places listing as a district.

TA-V has been completely inventoried for historic sites and no sites have been identified. Assessments of buildings in TA-V for inclusion in the National Register of Historic Places have not been made since structures located there are less than 50 years old. As the buildings at the site attain the 50-year mark, DOE will assess them for eligibility for inclusion in the National Register.

4.3.8.3 Native American Resources

Consultations to identify traditional cultural properties were conducted in connection with the preparation of the *SNL/NM SWEIS*. A traditional cultural property is a place or object that is significant to a particular living community. Fifteen Native American tribes with cultural interest in the area were contacted and no specific traditional cultural property locations were identified. However, some tribes have stated that they have cultural affinity to archaeological and natural sites on KAFB and expressed concerns for cultural sites that are important to them. Areas of concern to some of the tribes included the well-being and protection of natural and cultural sites; access to any traditional cultural properties identified in the future; concerns for the treatment of human remains that might be discovered; a desire to be consulted on Native American Graves Protection and Repatriation Act issues; claims of traditional use of the area before restricted access became effective; and use of the area for hunting and gathering of resources.

As noted above, TA-V has been completely inventoried for prehistoric sites and historic sites and no such sites have been identified. No traditional cultural properties have been identified on KAFB, including TA-V.

4.3.8.4 Paleontological Resources

Few paleontological resources have been discovered in the vicinity of KAFB, although fossil vertebrate remains have been found approximately 5 to 6 kilometers (3.1 to 3.7 miles) northwest of TA-V. These include an anklebone from a camel, a skull and teeth from a horse, and teeth from a hare. These fossils were excavated on the south side of Tijeras Arroyo and may have been transported varying distances from their original source. It is possible that fossils are present on KAFB, but are buried by the alluvial fan deposits from the Sandia Mountains (SNL/NM 1993). No fossils have been identified at TA-V.

4.3.9 Socioeconomics

Statistics for population, housing, community services, and local transportation are presented for the region of influence, a four-county area in New Mexico (**Figure 4-18**) that includes the city of Albuquerque, which is where approximately 97.5 percent of all SNL/NM employees reside (see **Table 4-25**). In 1997, SNL/NM employed 6,824 persons.

4.3.9.1 Regional Economic Characteristics

Between 1990 and 1999, the civilian labor force in the region of influence increased 18.8 percent to the 1999 level of 360,924. In 1999, the annual unemployment average in the region of influence was 4.0 percent, which was slightly less than the annual unemployment average for New Mexico (5.6 percent) (DOL 2000).

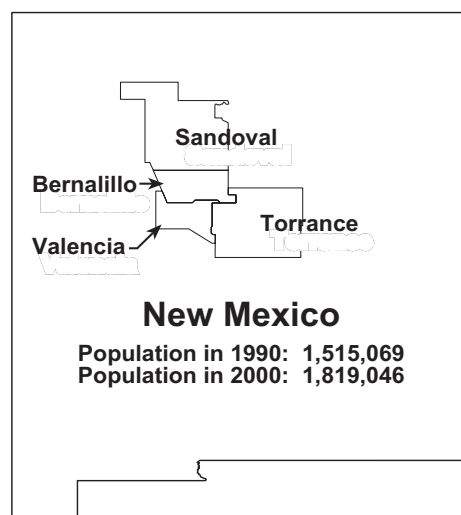


Figure 4-18 Counties in the SNL/NM Region of Influence

In 1997, service activities represented the largest sector of employment in the four-county area (33.3 percent). This was followed by retail trade (24.4 percent), and government (19.4 percent). The totals for these employment sectors in New Mexico were 27.5 percent, 23.7 percent, and 25.1 percent, respectively (NMDL 1998). SNL/NM is the fifth largest employer in New Mexico and the third largest in the four-county area.

Table 4-25 Distribution of Employees by Place of Residence in the SNL/NM Region of Influence in 1997

<i>County</i>	<i>Number of Employees</i>	<i>Total Site Employment (percent)</i>
Bernalillo	5,846	85.7
Sandoval	311	4.6
Torrance	160	2.3
Valencia	336	4.9
Region of influence total	6,653	97.5

Source: DOE 1999f.

4.3.9.2 Demographic Characteristics

The 2000 demographic profile of the region of influence population is included in **Table 4-26**. The 2000 population in the region of influence was 729,649 people, of whom about 76 percent lived in Bernalillo County. Persons self-designated as minority individuals comprise 52 percent of the total population. This minority population is composed largely of Hispanic or Latino and American Indian residents. The Pueblos of Cochiti, Isleta, Jemez, San Felipe, Sandia, Santa Ana, Santo Domingo, and Zia, and the Canoncito Navajo Reservation are important centers of these American Indian populations.

Income information for the SNL/NM region of influence is included in **Table 4-27**. Bernalillo, Sandoval, and Valencia Counties each had median household incomes near or above the New Mexico state average (\$30,836). The median household income for Torrance County (\$26,334) was below the state average. Torrance County had 24.6 percent of the population living below the poverty line compared to the New Mexico state average of 19.3 percent.

Table 4–26 Demographic Profile of the Population in the SNL/NM Region of Influence

	County				Region of Influence
	Bernalillo	Sandoval	Torrance	Valencia	
Population					
2000 population	556,678	89,908	16,911	66,152	729,649
1990 population	480,577	63,319	10,285	45,235	599,416
Percent change from 1990 to 2000	15.8	42.0	64.4	46.2	21.7
Race (2000) (Percent of Total Population)					
White	70.8	65.1	73.9	66.5	69.7
Black or African American	2.8	1.7	1.7	1.3	2.5
American Indian and Alaska Native	4.2	16.3	2.1	3.3	5.5
Asian	1.9	1.0	0.3	0.4	1.6
Native Hawaiian & Other Pacific Islander	0.1	0.1	0.1	0.1	0.1
Some other race	16.1	12.4	17.9	23.9	16.4
Two or more races	4.2	3.5	4.0	4.6	4.1
Percent Minority	51.7	49.7	42.8	60.6	52.0
Ethnicity (2000)					
Hispanic or Latino	233,565	26,437	6,283	36,371	302,656
Percent of total population	42.0	29.4	37.2	55.0	41.5

Source: DOC 2001.

Table 4–27 Income Information for the SNL/NM Region of Influence

	Bernalillo	Sandoval	Torrance	Valencia	New Mexico
Median household income 1997 (\$)	36,853	40,139	26,334	30,092	30,836
Percent of persons below poverty line (1997)	14.6	12.9	24.6	18.3	19.3

Source: DOC 2000.

4.3.9.3 Housing and Community Services

Table 4–28 lists the total number of occupied housing units and vacancy rates in the region of influence. In 1990, the four-county area contained 246,561 housing units, of which 225,289 were occupied. The median value of owner-occupied units was \$85,300 in Bernalillo County, which is higher than the other three counties and nearly twice the median value of units in Torrance County. Coincidentally, the vacancy rate was lowest in Bernalillo County (7.8 percent) and highest in Torrance County (24.8 percent).

Community services include public education and healthcare (i.e., hospitals, hospital beds, and doctors). In 1998, student enrollment in the region of influence totaled 120,159 and the average student-to-teacher ratio was 16.4:1 (Department of Education 2000). Community health services and facilities are concentrated in Bernalillo County.

Table 4–28 Housing and Community Services in the SNL/NM Region of Influence

	County				Region of Influence
	Bernalillo	Sandoval	Torrance	Valencia	
Housing (1990) ^a					
Total units	201,235	23,667	4,878	16,781	246,561
Occupied housing units	185,582	20,867	3,670	15,170	225,289
Vacant units	15,653	2,800	1,208	1,611	21,272
Vacancy rate (percent)	7.8	11.8	24.8	9.6	8.6
Median value (\$)	85,300	69,600	46,500	72,100	Not available
Public Education (1998) ^b					
Total enrollment	85,847	14,700	6,171	13,441	120,159
Student-to-teacher ratio	16.3:1	16.4:1	17.2:1	17.1:1	16.4:1
Community Healthcare (1998) ^c					
Hospitals	8	0	0	0	8
Hospital beds per 1,000 persons	3.1	0	0	0	2.3
Physicians per 1,000 persons	3.7	0.9	0.3	0.5	3

^a DOE 1999f.^b Department of Education 2000.^c Gaquin and DeBrandt 2000.

4.3.9.4 Local Transportation

Key roads in the vicinity of KAFB include Interstates 25 and 40 (see Figure 4–12). Interstate 25 runs north-south and is approximately 1.5 miles west of the KAFB boundary at its nearest approach. Interstate 40 runs east-west through Albuquerque and is approximately 1.6 kilometers (1 mile) north of the KAFB boundary at its nearest approach. Access to KAFB and SNL/NM consists of an urban road network maintained by the city of Albuquerque, the gates and roadways of KAFB, and SNL/NM-maintained roads. Traffic enters SNL/NM through three principal gates: Wyoming, Gibson, and Eubank. Most commercial traffic enters through the Eubank gate because it provides direct access to the SNL/NM shipping and receiving facilities located in TA-II. An additional entrance to KAFB, the Truman gate, serves KAFB's western areas. The roads near SNL/NM experience heavy traffic in the early morning and late afternoon. The principal contributors are SNL/NM staff and other civilian and military personnel commuting to and from KAFB.

The Burlington Northern & Santa Fe Railroad discontinued its spur into KAFB in 1994. Land within KAFB, permitted to DOE for the railroad right-of-way, has been returned to the U.S. Air Force and demolition of the spur has begun. Primary air service is provided for the entire region by the Albuquerque International Sunport, located immediately northwest of KAFB. Runways and other flight facilities are shared with KAFB.

4.3.10 Environmental Justice

Under Executive Order 12898, DOE is responsible for identifying and addressing disproportionately high and adverse impacts on minority or low-income populations. As discussed in Appendix E, minority persons are those who identify themselves as Hispanic or Latino, Asian, Black or African American, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, or multiracial. Persons whose income is below the Federal poverty threshold are designated as low-income.

TA-V is located at latitude $34^{\circ} 59' 46.13''$ north, longitude $106^{\circ} 31' 49.85''$ west. **Figure 4-19** shows the location of TA-V and the region of potential radiological impacts. As shown in the figure, the region surrounding TA-V includes the Albuquerque Metropolitan Area and Indian Reservations in the Albuquerque-Santa Fe areas.

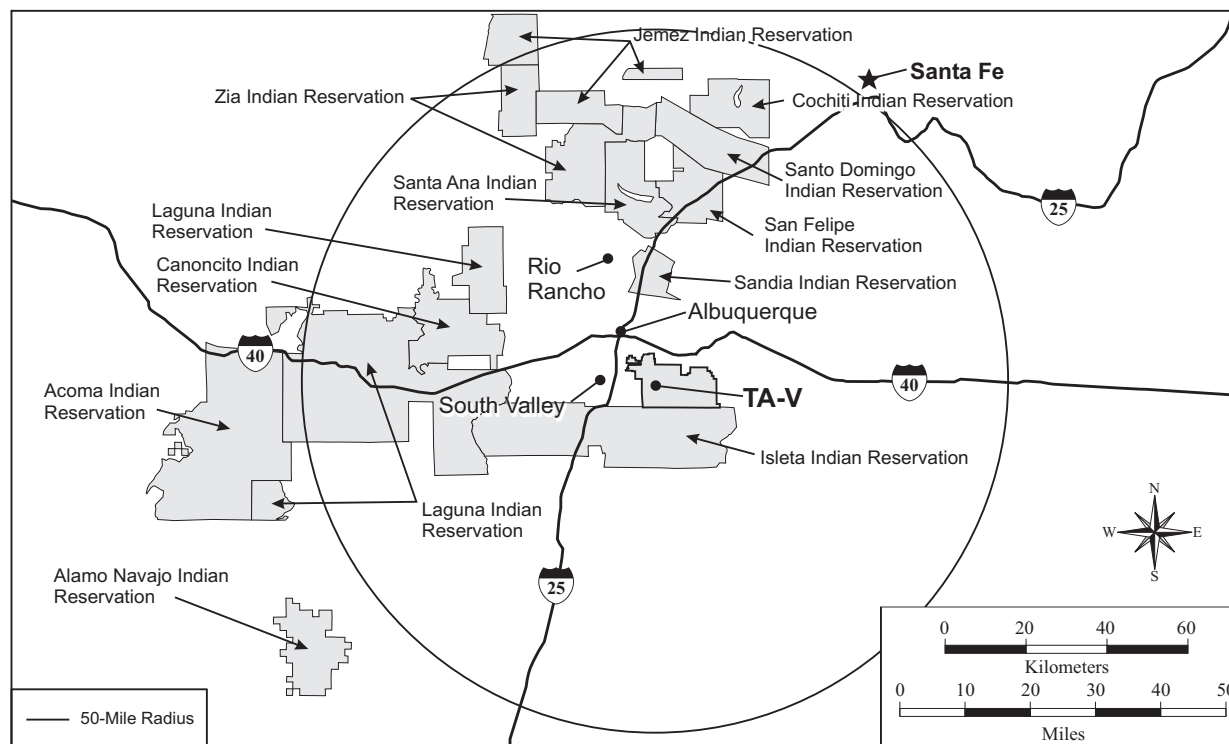


Figure 4-19 Location of TA-V and Indian Reservations Surrounding SNL/NM

Nine counties are included or partially included in the potentially affected area (see **Figure 4-20**): Bernalillo, Cibola, McKinley, Sandoval, San Miguel, Santa Fe, Socorro, Torrance, and Valencia. **Table 4-29** provides the racial and Hispanic composition for these counties using data obtained from the decennial census conducted in 2000. In the year 2000, a majority of these county residents designated themselves as members of a minority. Hispanics and American Indians/Alaska Natives comprised over 90 percent of the minority population. As a percentage of the total resident population in 2000, New Mexico had the largest percentage minority population (55 percent) among the contiguous states and the second largest percentage minority population among all of the states—only Hawaii had a larger percentage minority population (77 percent).

Figure 4-21 compares the growth in the minority populations in potentially affected counties between 1990 and 2000. As discussed in Section E.5.1 of Appendix E, data concerning race and Hispanic origin from the 2000 Census cannot be directly compared with that for the 1990 Census because the racial categories used in the two enumerations were different. Bearing this change in mind, the minority population in potentially affected counties increased from approximately 51 percent to 57 percent in the decade from 1990 to 2000. Hispanics and American Indians/Alaska Natives accounted for approximately 84 percent of the increase in minority population during the decade. For comparison, minorities composed approximately one-quarter of the total population of the United States in 1990 and nearly one-third of the total population in 2000.

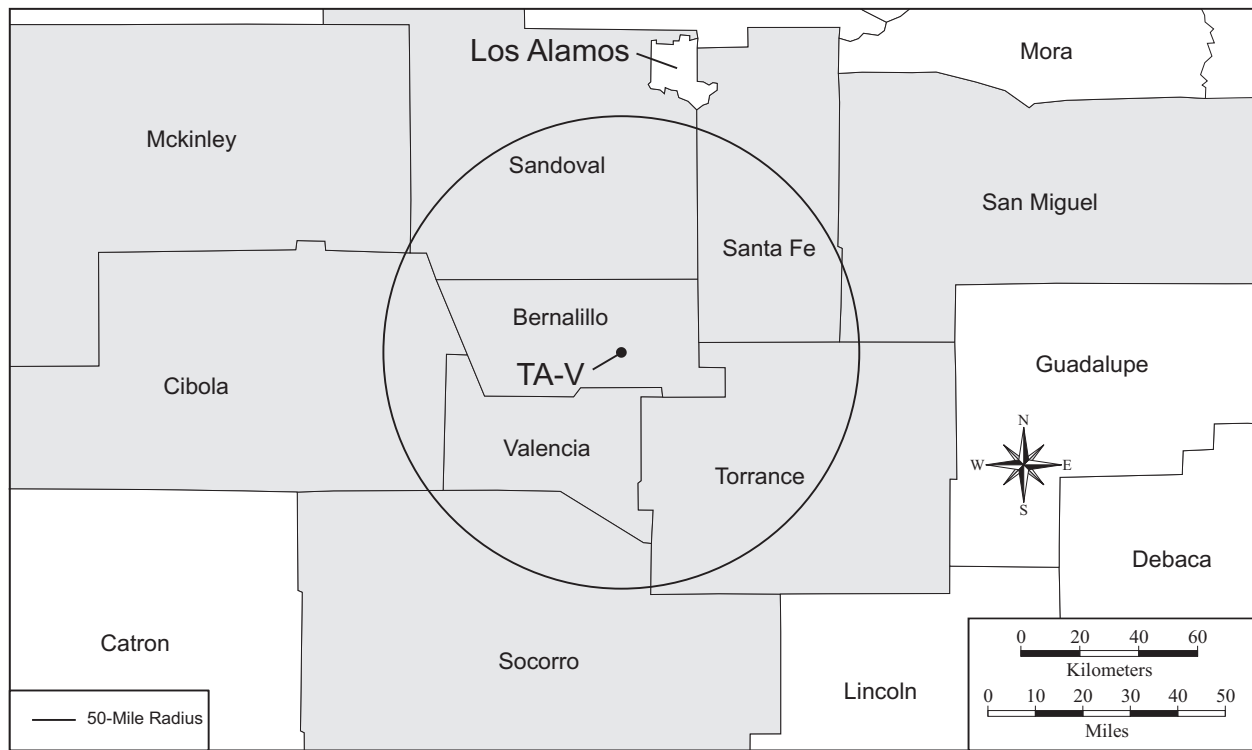


Figure 4-20 Potentially Affected Counties Surrounding TA-V at SNL/NM

Table 4-29 Populations in Potentially Affected Counties Surrounding TA-V in 2000

Population Group	Population	Percentage of Total
Minority	569,428	56.5
Hispanic	416,189	41.3
Black/African American	17,533	1.7
American Indian/Alaska Native	106,093	10.5
Asian	13,213	1.3
Native Hawaiian/Pacific Islander	647	0.1
Two or More Races	15,753	1.6
Some Other Race	1,644	0.2
White	436,466	43.3
Total	1,007,538	100.0

Source: DOC 2001.

The percentage of low-income population at risk in potentially affected counties surrounding TA-V in 1990 was approximately 15 percent. In 1990, nearly 13 percent of the total population of the continental United States reported incomes less than the poverty threshold. In terms of percentages, minority populations at risk are relatively large in comparison with the national percentage, while the percentage low-income population at risk is commensurate with the corresponding national percentage. Complete census data with block group resolution for minority and low-income populations obtained from the decennial census of 2000 are scheduled for publication in 2002.

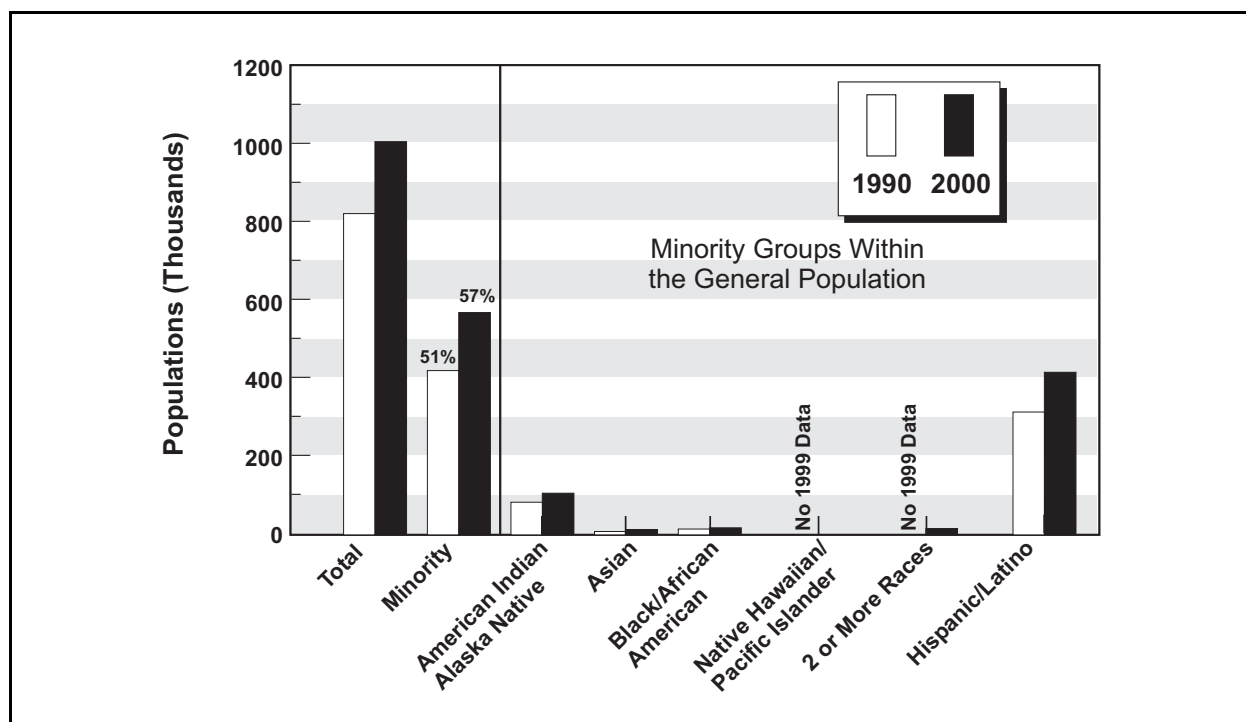


Figure 4–21 Comparison of Populations in Potentially Affected Counties Surrounding TA-V in 1990 and 2000

4.3.11 Existing Human Health Risk

Public and occupational health and safety issues include the determination of potentially adverse effects on human health that result from acute and chronic exposures to ionizing radiation and hazardous chemicals.

4.3.11.1 Radiation Exposure and Risk

Major sources and levels of background radiation exposure to individuals in the vicinity of SNL/NM are shown in **Table 4–30**. Annual background radiation doses to individuals are expected to remain constant over time. The total dose to the population, in terms of person-rem, changes as the population size changes. Background radiation doses are unrelated to SNL/NM operations.

Releases of radionuclides to the environment from SNL/NM operations provide another source of radiation exposure to individuals near the site. Types and quantities of radionuclides released from SNL/NM operations in 1999 are listed in the *1999 Annual Site Environmental Report, Sandia National Laboratories, Albuquerque, New Mexico* (SNL/NM 2001b). The releases are summarized in Section 4.3.3.2 of this EIS. The doses to the public resulting from these releases are presented in **Table 4–31**. These doses fall within the radiological limits given in DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, and are much lower than those of background radiation.

Table 4–30 Sources of Radiation Exposure to Individuals in the SNL/NM Vicinity Unrelated to SNL/NM Operations

<i>Source</i>	<i>Effective Dose Equivalent (millirem per year)</i>
Natural Background Radiation	
Total external (cosmic and terrestrial) ^a	92
Internal terrestrial and global cosmogenic ^b	40
Radon in homes (inhaled)	200 ^{b, c}
Other Background Radiation^b	
Diagnostic x rays and nuclear medicine	53
Weapons test fallout	less than 1
Air travel	1
Consumer and industrial products	10
Total	397

^a SNL/NM 1999a, SNL/NM 2001b.^b NCRP 1987.^c An average for the United States.**Table 4–31 Radiation Doses to the Offsite Public from Normal SNL/NM Operations in 1999 (total effective dose equivalent)**

<i>Members of the Public</i>	<i>Atmospheric Releases</i>		<i>Liquid Releases</i>		<i>Total</i>	
	<i>Standard^a</i>	<i>Actual</i>	<i>Standard^a</i>	<i>Actual</i>	<i>Standard^a</i>	<i>Actual</i>
Maximally exposed offsite individual (millirem)	10	0.00021	4	0	100	0.00021
Population within 80 kilometers (50 miles) (person-rem) ^b	None	0.0221	None	0	100	0.0221
Average individual within 80 kilometers (50 miles) (millirem) ^c	None	3.2×10^{-5}	None	0	None	3.2×10^{-5}

^a The standards for individuals are given in DOE Order 5400.5. As discussed in that order, the 10-millirem-per-year limit from airborne emissions is required by the Clean Air Act (40 CFR 61) and the 4-millirem-per-year limit is required by the Safe Drinking Water Act (40 CFR 141). The total dose of 100 millirem per year is the limit from all pathways combined. The 100-person-rem value for the population is given in proposed 10 CFR 834, *Radiation Protection of the Public and Environment: Proposed Rule*, as published in 58 FR 16268. If the potential total dose exceeds the 100-person-rem value, the contractor operating the facility is required to notify DOE.

^b Based on an estimated population of 695,400 in 1999.

^c Obtained by dividing the population dose by the number of people living within 80 kilometers (50 miles) of the site.

Source: SNL/NM 2001b.

Using a risk estimator of 1 latent cancer death per 2,000 person-rem to the public (see Appendix B), the fatal cancer risk to the maximally exposed member of the public due to radiological releases from SNL/NM operations in 1999 is estimated to be 1.1×10^{-10} . That is, the estimated probability of this hypothetical person dying of cancer at some point in the future from radiation exposure associated with one year of SNL/NM operations is about 1 in 10 billion (it takes several to many years from the time of radiation exposure for a cancer to manifest itself).

According to the same risk estimator, 1.1×10^{-5} excess fatal cancers are projected in the population living within 80 kilometers (50 miles) of SNL/NM from normal operations in 1999. To place this number in perspective, it may be compared with the number of fatal cancers expected in the same population from all causes. The mortality rate associated with cancer for the entire U.S. population is 0.2 percent per year. Based on this mortality rate, the number of fatal cancers expected during 1999 from all causes in the population living within 80 kilometers (50 miles) of SNL/NM was 1,390. This expected number of fatal cancers is much higher than the 1.1×10^{-5} fatal cancers estimated from SNL/NM operations in 1999.

Members of the public living on site at KAFB receive the same dose as the offsite public from background radiation, but they also receive an additional dose from SNL/NM facilities with nuclear materials. The maximum exposed individual on site would be a hypothetical member of the public (onsite public housing resident) located near the Kirtland Underground Munitions Storage Complex. The maximum dose to the onsite person and the cumulative dose to all onsite residents from operations in 1999 are presented in **Table 4–32**. According to a risk estimator of one latent fatal cancer per 2,000 person-rem (see Appendix B), the number of projected fatal cancers among onsite residents from normal operations in 1999 is 2.6×10^{-7} .

Table 4–32 Radiation Doses to the Onsite Public in 1999 and to Workers in 1998 Due to Normal SNL/NM Operations (total effective dose equivalent)

<i>Onsite Receptor</i>	<i>Onsite Releases and Direct Radiation</i>	
	<i>Standard</i>	<i>Actual</i>
Maximally exposed onsite public receptor (millirem per year)	Refer to Table 4-31	8.5×10^{-4}
Collective KAFB resident population (person-rem per year) ^a	None	5.1×10^{-4}
Average badged worker (millirem per year) ^b	None ^c	52
Collective badged worker population (person-rem per year) ^b	None	9.5

^a Based on a population of 5,670 people estimated to be living in permanent on-base housing.

^b Based on a badged worker population of 181 receiving a measured total effective dose equivalent over 10 millirem.

^c No standard is specified for an average radiation worker; however, the radiological limit for an individual worker is 5,000 millirem per year (10 CFR 835). DOE's goal is to maintain radiological exposure as low as is reasonably achievable. Therefore, DOE has recommended an administrative control level of 500 millirem per year (DOE 1999e); the site must make reasonable attempts to maintain individual worker doses as low as reasonably achievable below this level.

Sources: DOE 1998c, SNL/NM 2001b.

The average dose to a badged worker and the collective dose to the badged worker population, both of whom have a measured total effective dose equivalent greater than 10 millirems, are also shown in Table 4–32. The risk estimator for workers is one latent fatal cancer per 2,500 person-rem. The risk estimator for workers is lower than the estimator for the public because of the absence from the workforce of the more radiosensitive infant and child age groups. Based on the risk estimator for workers, the number of projected fatal cancers in the badged worker population of 181 from normal operations in 1998 is 0.0038.

A more detailed presentation of the radiation environment, including background exposures and radiological releases and doses, is presented in the *1999 Annual Site Environmental Report, Sandia National Laboratories, Albuquerque, New Mexico* (SNL/NM 2001b). The concentrations of radioactivity in various environmental media (including air, water, and soil) in the site region (on and off the site) also are presented.

External radiation doses have been measured on the SNL/NM site that may contain radiological sources for comparison with offsite natural background radiation levels. Measurements taken in 1999 showed an average onsite dose on the SNL/NM site of 109 millirem compared to an offsite dose of 99 millirem (SNL/NM 2001b).

External concentrations of gross alpha and beta radiation in air are measured at SNL/NM. The concentrations in air of gross alpha and beta radiation in the general vicinity of TA-V in 1999 were 3.9×10^{-15} curies per cubic meter and 1.12×10^{-14} curies per cubic meter, respectively. These concentrations were about the same as measured at other onsite locations (SNL/NM 2001b).

4.3.11.2 Chemical Environment

The background chemical environment important to human health consists of the atmosphere, which may contain hazardous chemicals that can be inhaled; drinking water, which may contain hazardous chemicals that can be ingested; and other environmental media with which people may come in contact (e.g., soil through direct contact or via the food pathway).

Adverse health impacts to the public are minimized through administrative and design controls to decrease hazardous chemical releases to the environment and to achieve compliance with permit requirements. The effectiveness of these controls is verified through the use of monitoring information and inspection of mitigation measures. Health impacts to the public may occur during normal operations at SNL/NM via inhalation of air containing hazardous chemicals released to the atmosphere by SNL/NM operations. Risks to public health from ingestion of contaminated drinking water or direct exposure to hazardous chemicals are also potential pathways.

Baseline air emission concentrations for air pollutants and their applicable standards are presented in Section 4.3.3.1. These concentrations are estimates of the highest existing offsite concentrations and represent the highest concentrations to which members of the public could be exposed. These concentrations are compared with applicable guidelines and regulations.

Chemical exposure pathways to SNL/NM workers during normal operation may include inhaling the workplace atmosphere, drinking SNL/NM potable water, and other possible contacts with hazardous materials associated with work assignments. Workers are protected from hazardous materials specific to the workplace through appropriate training, protective equipment, monitoring, and management controls. SNL/NM workers are also protected by adherence to OSHA and EPA occupational standards that limit atmospheric and drinking water concentrations of potentially hazardous chemicals. Appropriate monitoring, which reflects the frequency and amounts of chemicals utilized in the operation process, ensures that these standards are not exceeded. Additionally, DOE requirements ensure that conditions in the workplace are as free as possible from recognized hazards that cause or are likely to cause illness or physical harm. Therefore, worker health conditions at SNL/NM are substantially better than are required by standards.

4.3.11.3 Health Effects Studies

There are no known epidemiological studies that examine the impact of SNL/NM on the health of the surrounding communities. The Office of Epidemiologic Studies Epidemiologic Surveillance Program has been implemented at SNL/NM to monitor the health of current workers at the Albuquerque site. This program monitors and evaluates the occurrence of illness and injury in the workforce on a continuing basis and issues annual reports. Epidemiologic surveillance makes use of routinely collected health data including reasons for illness absence, disabilities, and the OSHA recordable injuries and illnesses. These health event data, coupled with demographic data about the active workforce, are analyzed to evaluate whether particular occupational groups are at increased risk of disease or injury when compared with other workers at SNL/NM. A summary of epidemiological surveillance at SNL/NM can be found in Volume II, Appendix E, Section E.4.8 of the *Final Programmatic Environmental Impact Statement for Stockpile Stewardship and Management* (DOE 1996f).

4.3.11.4 Accident History

A review of the SNL/NM annual environmental and accidental reports indicates that there have been no significant adverse impacts to workers, the public, or the environment. This review was performed to examine the site's accident history. The period of review, from 1986 to 1990, was a time during which plant operations were much higher than in previous years and the years following the review period (DOE 1996f).

4.3.11.5 Emergency Preparedness

Each DOE site has an established emergency management program that would be activated in the event of an accident. This program has been developed and is maintained to ensure adequate response to most accident conditions and to provide response efforts for accidents not specifically considered. The emergency management program incorporates activities associated with planning, preparedness, and response (DOE 1996f). In addition, DOE has specified actions to be taken at all DOE sites to implement lessons learned from the emergency response to an accidental explosion at Hanford in May 1997.

4.3.12 Waste Management

Waste management includes minimization, characterization, treatment, storage, transportation, and disposal of waste generated from ongoing DOE activities. The waste is managed using appropriate treatment, storage, and disposal technologies, and in compliance with all applicable Federal and state statutes and DOE orders.

4.3.12.1 Waste Inventories and Activities

SNL/NM manages the following types of waste: transuranic, mixed transuranic, low-level radioactive, mixed low-level radioactive, hazardous, and nonhazardous. Because there is no transuranic or mixed transuranic waste associated with TA-18 operations, these waste types are not discussed in this EIS. Waste generation rates and the inventory of stored waste from activities at SNL/NM are provided in **Table 4-33**. The SNL/NM waste management capabilities are summarized in **Table 4-34**.

Although not listed on the National Priorities List, SNL/NM adheres to the CERCLA guidelines for environmental restoration projects that involve certain hazardous substances not covered under RCRA. The initial remedial assessment of SNL/NM potential release sites was conducted under CERCLA beginning in 1984 and ending in 1987. The assessment identified 117 potential release sites. By 1993, the number had increased to 219 potential release sites, including offsite locations. Remediation field activities conducted under the Environmental Restoration Project are scheduled for completion in FY02, with permit modification by FY04 to remove remediated release sites from further action. As of August 1998, 60 release sites remained on the list for restoration or additional assessment. SNL/NM has proposed to the appropriate regulatory authority no further action for 122 of the 182 release sites. There are 11 environmental restoration sites within TA-V. Only two of these sites are classified as potential release sites. One is an oil release near Building 6597 (soil contamination) and the other is trichloroethylene contamination (potential groundwater contamination) near the guard gate on the north side of the TA. Both of these sites are under investigation (SNL/NM 2001a). More information on regulatory requirements for waste disposal is provided in Chapter 6.

Table 4–33 Waste Generation Rates and Inventories at SNL/NM

<i>Waste Type</i>	<i>Generation Rate (cubic meters per year)</i>	<i>Inventory (cubic meters)</i>
Low-level radioactive	577	336
Mixed low-level radioactive	143	152
Hazardous (in kilograms)		
Resource Conservation and Recovery Act	36,965	Not applicable ^a
Toxic Substance Control Act	122,000	Not applicable ^a
Nonhazardous		
Liquid	1,060,000	Not applicable ^a
Solid	2,100	Not applicable ^a

^a Generally, hazardous and nonhazardous wastes are not held in long-term storage.

Source: DOE 1999f.

Table 4–34 Waste Management Capabilities at SNL/NM^a

Facility Name/Description	Capacity	Status	Applicable Waste Type		
			Low-Level Radioactive Waste	Mixed Low-Level Radioactive Waste	Hazardous
Treatment Facility (cubic meters per year)					
RMWMF ^b	61,326	Online		X	
HBWSF ^b	61,326	Online		X	
Thermal Treatment Facility (in kilograms)	136	Online			X ^c
Storage Facility (cubic meters)					
RMWMF in TA-III	8,000	Online	X	X	
High bay (6596) in TA-I	1,800	Online	X	X	
Interim storage site in TA-III	510	Online	X	X	
Manazno bunkers ^d	1,556	Online	X	X	
HWMF Waste Packaging Building 959	22	Online			X
HWMF Waste Packaging Building 958	227	Online			X
HWMF Modular Storage Buildings	38	Online			X

RMWMF = Radioactive and Mixed Waste Management Facility; HBWSF = High Bay Mixed Waste Storage Facility; HWMF = Hazardous Waste Management Facility

^a There are no treatment, storage or disposal facilities for nonhazardous wastes located at SNL/NM. Off site facilities are used.

^b Treatment options are discussed in the SNL/NM Site Treatment Plan. Final approval of treatment options is not expected prior to renewal of the existing hazardous waste permit sometime after 2000. DOE has paid annual operating fees associated with the treatment units since 1996.

^c Treatment of explosive waste.

^d Includes Manazno Bunkers 37034, 37045, 37055, 37057, 37063, 37078, 37118.

Source: DOE 1999f.

4.3.12.2 Low-Level Radioactive Waste

SNL/NM generates low-level radioactive waste as a result of research and development activities. Small quantities of low-level radioactive waste can be received periodically from remote test facilities including Kauai, Hawaii; White Sands Missile Range, New Mexico; and Tonopah Test Range, Nevada. Most of the low-level radioactive waste consists of contaminated equipment and combustible decontamination materials and cleanup debris. The Radioactive and Mixed Waste Management Facility in TA-III processes low-level radioactive waste to meet the waste acceptance criteria of designated DOE disposal sites (DOE 1996f).

4.3.12.3 Mixed Low-Level Radioactive Waste

In general, mixed low-level radioactive waste is generated during laboratory experiments and components testing. Mixed low-level radioactive waste generated at SNL/California has also been shipped to SNL/NM for management in accordance with a New Mexico Environment Department compliance order issued under the Federal Facility Compliance Act.

SNL/NM has the capability to treat some mixed wastes on site at the Radioactive and Mixed Waste Management Facility and the High Bay Mixed Waste Storage Facility. Treatment options include thermal treatment, neutralization, chemical treatment, centrifugation, encapsulation, flocculation, physical treatment, reverse osmosis, and mechanical processing.

Processing includes activities required to comply with the waste acceptance criteria and Federal regulations. Pursuant to the Federal Facility Compliance Act, SNL/NM developed a site treatment plan for mixed wastes. The site treatment plan is intended to bring SNL/NM into compliance with land disposal restrictions (storage prohibitions) under the New Mexico Hazardous Waste Act and RCRA. DOE submitted a proposed site treatment plan, and on October 6, 1995, a Compliance Order was issued by the State of New Mexico requiring SNL/NM to comply with the site treatment plan for the treatment of mixed wastes at SNL/NM (DOE 1996f).

4.3.12.4 Hazardous Waste

The Hazardous Waste Management Facility, located in TA-II, performs safe handling, packaging, short-term storage, and shipping of all RCRA-regulated, Toxic Substances Control Act-regulated, and other hazardous and toxic waste categories, except explosives. The hazardous waste generated at SNL/NM predominantly results from experiments, testing, research and development activities, and infrastructure fabrication and maintenance. Environmental restoration and decontamination and decommissioning also generate hazardous waste. In addition, SNL/NM manages small amounts of waste from other operations such as SNL/NM's Advanced Materials Laboratory on the University of New Mexico campus in Albuquerque or DOE's Albuquerque Operations Office.

Hazardous waste generated by SNL/NM is collected and transported to the Hazardous Waste Management Facility for packaging and short-term (less than one year) storage prior to offsite transportation for recycling, treatment, or disposal at a licensed facility.

The Thermal Treatment Facility, located in the northeast corner of TA-III, is used to thermally treat small quantities of waste explosive substances, waste liquids contaminated with explosive substances, and waste items (e.g., rags, wipes, and swabs) contaminated with explosive substances. No radioactive waste is treated at the Thermal Treatment Facility.

4.3.12.5 Nonhazardous Waste

Solid waste consists predominantly of office and nonhazardous laboratory trash. It does not include food waste from cafeteria operations, which is managed under a separate contract with the U.S. Air Force. Nonhazardous building debris generated from decontamination and decommissioning activities may also be considered solid waste; however, it is currently managed at KAFB. After nonhazardous solid waste is transferred to the Solid Waste Transfer Facility, it is screened for improperly disposed of, potentially hazardous materials, which are removed from the trash and disposed of through appropriate processes. All solid waste is currently disposed of at the Rio Rancho Sanitary Landfill in Rio Rancho, New Mexico.

In 1996, the SNL/NM sewer system consisted of a 64-kilometer (40-mile) underground pipe network that discharged approximately 1 million liters (280 million gallons) of industrial and domestic wastewater. Wastewater has leaked from underground sewer lines. Possible soil contamination associated with these leaks is being investigated and cleaned up as part of the Environmental Restoration Project.

4.3.12.6 Waste Minimization

SNL/NM has an active waste minimization and pollution prevention program to reduce the total amount of waste generated and disposed of at the site. This is accomplished by eliminating waste through source reduction or material substitution; by recycling potential waste materials that cannot be minimized or eliminated; and by treating all of the waste that is generated to reduce its volume, toxicity, or mobility prior to storage or disposal. Achievements and progress in this area have been updated at least annually. Implementing pollution prevention projects reduced the total amount of waste generated at SNL/NM in 1999 by approximately 8 cubic meters (10.5 cubic yards). Examples of pollution prevention projects completed in 1999 at SNL/NM include the reduction of sanitary waste by 5,895 metric tons (6,496 tons) by crushing concrete and asphalt material for reuse, thereby eliminating the need to purchase new materials (DOE 2000i).

4.3.12.7 Waste Management PEIS Records of Decision

The *Waste Management PEIS* Records of Decision affecting SNL/NM are shown in **Table 4–35**. Decisions on the various waste types were announced in a series of Records of Decisions published after publication of the *Waste Management PEIS* (DOE 1997a). The hazardous waste Record of Decision was published on August 5, 1998 (63 FR 41810), and the low-level radioactive and mixed low-level radioactive waste Record of Decision was published on February 18, 2000 (65 FR 10061). The hazardous waste Record of Decision states that most DOE sites will continue to use offsite facilities for the treatment and disposal of major portions of nonwastewater hazardous waste. The Oak Ridge Reservation and the Savannah River Site will continue treating some of their own nonwastewater hazardous waste on site in existing facilities, where this is economically feasible. The low-level radioactive waste and mixed low-level radioactive waste Record of Decision states that, for the management of low-level radioactive waste, minimal treatment will be performed at all sites and onsite disposal will continue, to the extent practicable, at INEEL, LANL, the Oak Ridge Reservation, and the Savannah River Site. In addition, Hanford and NTS will be available to all DOE sites for low-level radioactive waste disposal. Mixed low-level radioactive waste will be treated at Hanford, INEEL, the Oak Ridge Reservation, and the Savannah River Site, and will be disposed of at Hanford and NTS. More detailed information concerning DOE's decisions for the future configuration of waste management facilities at SNL/NM is presented in the hazardous waste and low-level radioactive waste and mixed low-level radioactive waste Records of Decision.

Table 4–35 Waste Management PEIS Records of Decision Affecting SNL/NM

<i>Waste Type</i>	<i>Preferred Action</i>
Low-level radioactive	DOE has decided to treat SNL/NM's low-level radioactive waste on site and to ship the waste to either the Hanford Site or NTS for disposal. ^a
Mixed low-level radioactive	DOE has decided to regionalize treatment of mixed low-level radioactive waste at the Hanford Site, INEEL, the Oak Ridge Reservation, and the Savannah River Site. DOE has decided to ship SNL/NM's mixed low-level radioactive waste to either the Hanford Site or NTS for disposal. ^a
Hazardous	DOE has decided to continue to use commercial facilities for treatment of SNL/NM's nonwastewater hazardous waste. ^b

^a From the Record of Decision for low-level radioactive and mixed low-level radioactive waste (65 FR 10061).

^b From the Record of Decision for hazardous waste (63 FR 41810).

Sources: 65 FR 10061, 63 FR 41810.